Database Management System (Application)

Winter-2022

Winter Exam-2022
Solutions – Database Management System (Application)

Q.1. (a) 10

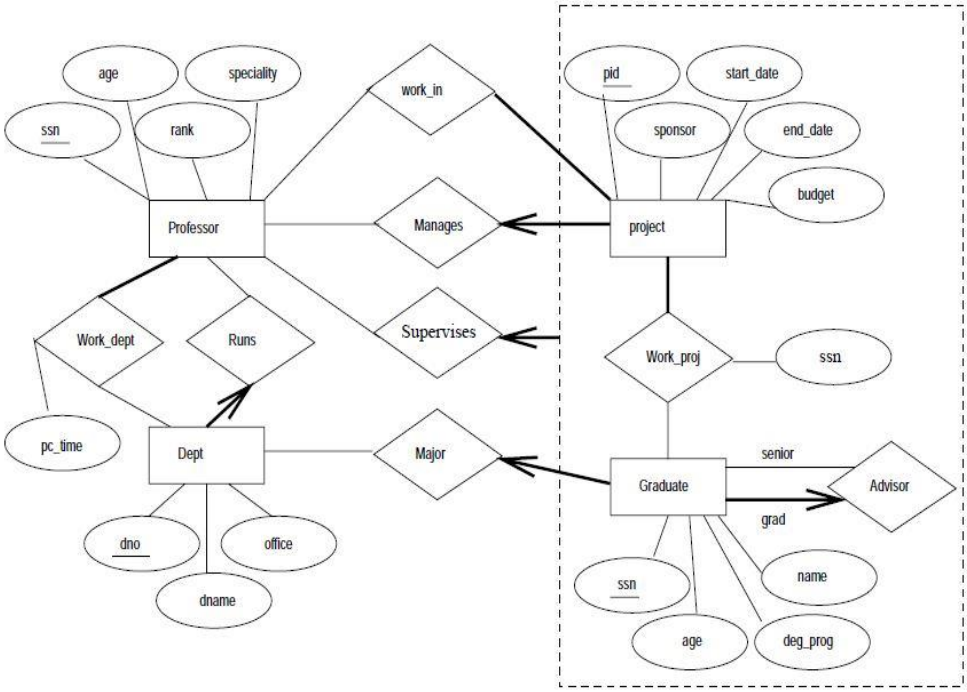


Figure 2.1 ER Diagram for Exercise 2.3

Q.1. (b) Views are generally used to focus, simply, and customize the perception each user has of the database. Views can be used as security mechanisms by allowing users to access data through the view, without granting the users permissions to directly access the underlying base tables of the view. 04

Most users interact with the database using the database views. A key to creating a useful database is a well-chosen set of views. Luckily, while view are powerful, they are also easy to create.

Total Marks 14

Q.2.

Production Units

Serial#	ExactWeight	ProductType	ProductDesc	QualityTest?	LotNumber

Lot

LotNumber	CreateDate	CostOfMaterials

Raw Materials Usage

LotNumber	MaterialID	Units

Raw Materials

MaterialID	Type	UnitCost

Grading:

Strong Entities – Production Units, Lot, Raw Materials: **(1.5)**

Exists, Has attributes, Has Primary key defined.

- One to Many Relationship – Lot Number as Foreign Key on Production Unit Entity: **(3.5)**

  Exists or not

- Many to Many Relationship - Relation for Raw Material Usage: **(3.5)**

  Relation exists, Has primary key correctly identified, has additional attribute

- Referential Integrity Constraints Correct - **(1.5)**

Total Marks 10

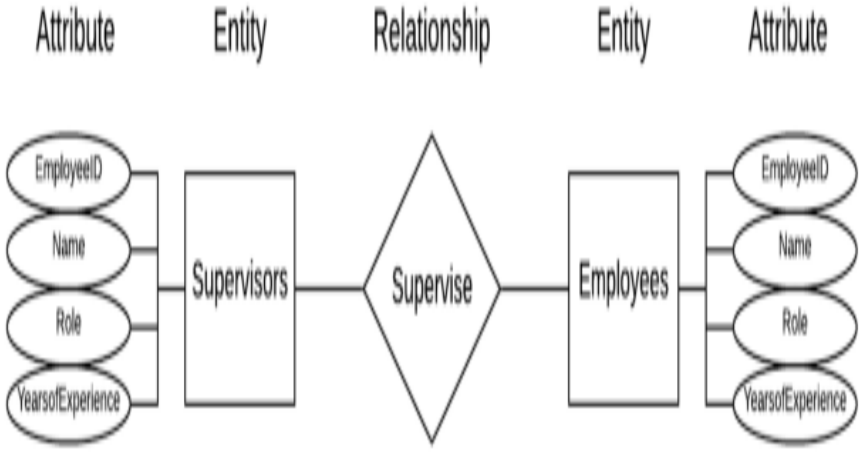
Q.3. (a) To some extent it depends on your application, each database model has its own strength. For example, the document model is suitable for text or semi-structured data. On the other hand, if you have atomic data, the relational model is your best option. 03

It also depends on which DBMS you use. Many DBMSs are built to work only with one particular model and the user does not have any other choices.

Q.3. (b) Entity-Relationship is a form of modeling that tries to imitate the relationships that exist among entities in the real world. In ER modeling, entities are some aspect of the real world, e.g. an event, a location, persons, and relationships, as its name suggests, are the relationship between these entities. 07

In ER modeling, all entities have their attributes, which in the real world can be looked at characteristics of the object. For example, if employee is an entity, then the name of that employee is one of its attributes.

As an example of ER modeling, we can model one form of relationship among employees as below: two entities, i.e. supervisors and employees, and a relationship, i.e. supervise. You can model your entire organization like this.



ER model of employees

Total Marks 10

Q.4. a OLTP and OLAP are both online processing systems. OLTP stands for "Online Transaction Processing" and it is a system that manages transaction-oriented applications, and OLAP stands for "Online Analytical Processing", and it is a system to manage analytical queries. 07

The major difference between the two systems is that OLTP is a write-heavy system and OLAP is a read-heavy system. This difference has a major impact on their implementation. For example, it is very important for OLTP systems to adopt a proper concurrency control, while this is not a major concern in read-heavy operations. Another difference between the two systems is that OLTP queries are generally simple and return relatively small number of records while OLAP queries are very complex and involve many intricate joins and aggregations.

The other difference is that due to the real-time nature of OLTP systems, they often follow a decentralized architecture to avoid single points of failure, while OLAP systems often have centralized architecture.

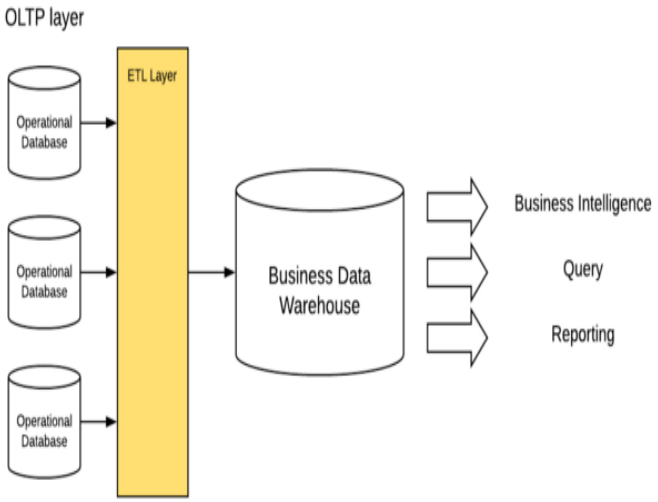
Also, in the majority of DBMSs, OLTP is row-based database and OLAP is columnar database.

Q.4. b Normalization is a process that organizes the data into multiple tables to minimize redundancy. De-normalization is the opposite process. It combines the normalized tables into one table so that data retrieval becomes faster. The main advantage of normalization is the better use of disk spaces. It is also easier to maintain the integrity of the database when it is normalized. 04

JOIN is the operation that allows us to reverse the normalization and create a de-normalized form of the data.

Q.4. c It is a process of collecting (extracting, transforming, and loading) data from heterogeneous sources and storing them into one database. You can consider the data warehouse as a central repository where data flows into it from the transactional systems and other relational databases. It can correlate broad business data to provide greater executive insight into an organization performance. The data warehouse is the core of the business intelligence, which is a system for data analysis and reporting. 05

This database is maintained separately from standard operational databases. They are two separate systems, the latter are optimized to update real-time data quickly and accurately, while the former is mostly suitable for offline operations to give a long-range view of data over time.



Total Marks 16

Q.5. a SQL statements are high-level instructions and each statement is responsible for a specific task. These statements can generally be classified into five categories: 06

Data Definition Language (DDL)
* This family of SQL commands is used to define database schema.
* Examples include CREATE , DROP, ALTER

Data Manipulation Language (DML)
* This family of SQL commands is used to modify the data inside a table.
* Examples include INSERT , UPDATE , DELETE

Data Query Language (DQL)
* This family of SQL commands performs query on existing tables.
* Examples include SELECT

Data Control Language (DCL)
* This family of SQL commands deals with the rights and permissions.
* Examples include GRANT , REVOKE

Transaction Control Language (TCL)
* This family of SQL commands deals with transactions.
* Examples include COMMIT , ROLLBACK , SAVEPOINT
* You only need these commands if you have OLTP operation.

Q.5. b They are closely related. DDL is responsible to define the structure of the table, basically what is allowed to enter the table and what is not allowed. DDL can be regarded as a set of rules that shape the table structure (schema). After DDL defines the schema, then it is DML job to fill the table with the data. 04

Q.5. c Both of these functions return a single value, the difference is the input, scalar functions operate on a single value while aggregate functions operate on a set of values. I try to clarify the difference with an example. For example, string functions like ISNULL(), ISNUMERIC(), LEN() are scalar functions. They input a single value and return a single value. On the other hand, AVG(), MAX(), SUM() are aggregate functions, they input multiple values and output a single value. 04

Total Marks 14

Q.6. a The users or end-users are the people who use the DBMS to perform different operations on database. The end-users access the DBMS through application programs interface, IDE provided by DBMS or SQL interface. 04

The end-users need not have complete knowledge of computer system and databases. They can install new software and operating systems into the computer.

Q.6. b The characteristics or properties of an entity that describe it are called ***attributes***. An entity may have many attributes. For example, an entity "STUDENT" may be described by his class roll number, name, his height, his address, his color etc. These are the attributes of "STUDENT" entity. 04

In E-R diagram, an attribute is represented by placing its name in an ellipse shape (or oval shape). It is connected to its associated entity by drawing a line.

Q.6. c **DATABASE DESIGN PROCESS** 08

The database design is very important and creative activity. The major objective of database design is to map the conceptual data model to an implementation model that a particular DBMS can process. The database and database system must be acceptable to the organization and all its users. The users can easily perform different operations on the database and no problem can be created for users.

Phases in Database Development Process

The database development process includes a series of phases. The major phases are: planning, analysis, design, and implementation. Each phase is divided into steps. The phases of database development process are:

- **Planning**
  The database planning phase begins when a customer requests to develop a database system. It is a set of tasks or activities. It decides the resources required in the database development. It also decides the time limits for the completion of the system.

- **Analysis**
  Analysis is done in order to understand or study the current system. It is very important activity for the development of database system. In this phase, the requirements and expectations of the users are collected and analyzed. The collected requirements help to understand the current system and for the improvement of that system (or for designing the new system).

- **Database Design**
  The database design is very important step of database development process. In this phase, the database structure is designed.

  Database design is divided into two steps:

  – **Logical Database Design**
    In logical database design, the conceptual data model (or logical data model) is converted into database structure for a specific DBMS. If there is a relational DBMS, then the conceptual data models are mapped to the normalized relations.

  – **Physical Database Design**
    In Physical database design, the logical database design is converted into physical storage structures such as files and tables. The indexes and access methods are also specified. Similarly, physical design is also concerned with security, backup and recovery etc.

- **Implementation**
  After the design phase and selecting a suitable DBMS, the database system is implemented. The purpose of this phase is to install and run the database system.

  In database implementation phase, the ***database administrator (DBA)*** normally requires a server computer. The *DBA* may also need the services of network administrator to connect the users with the server. The users can share information through the server (database server).

Total Marks 16

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